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**BEFORE THE**

**AGRICULTURE COMMITTEE, SUBCOMMITTEE ON CONSERVATION, CREDIT,  
RURAL DEVELOPMENT AND RESEARCH  
U.S. HOUSE OF REPRESENTATIVES**

**JUNE 27, 2001**

Mr. Chairman and Members of the subcommittee, on behalf of the Agricultural Research Service (ARS), I am pleased to be here today to talk about what ARS is doing for American agriculture and how our agency responded to the directives in the Federal Agriculture Improvement and Reform Act of 1996 (1996 Farm Bill) and the Agricultural Research, Extension, and Education Reform Act of 1998 (1998 Research Title).

As the Department of Agriculture's in-house research agency, ARS maintains a balanced program of fundamental and applied research that is long-term and high risk and therefore not cost-effective for the private sector. ARS research emphasizes solving agricultural problems that are national or regional in scope and in the best interests of the Nation as a whole ARS. We also provide objective scientific expertise for U.S. Department of Agriculture (USDA) regulatory and action agencies. Our science fuels USDA agencies like the Animal and Plant Health Inspection Service (APHIS), the Food Safety Inspection Service (FSIS), the Natural Resources Conservation Service (NRCS), and the Grain Inspection, Packers and Stockyard Administration (GIPSA) as they work to create responsible policy and carry out their missions effectively. ARS also serves a number of other Federal agencies such as the Food and Drug Administration, the Environmental Protection Agency, and some components within the Department of Defense, and the Department of the Interior.

ARS carries out its mission with a network of highly skilled scientists, engineers, technicians, and support people who can respond quickly to emerging problems. ARS has the unique ability to form interdisciplinary research teams from a diverse scientific workforce with geographical and discipline expertise. Not only do we carry out and support excellent relevant science but we are also charged with providing information access and technology dissemination of the results of our research to the people who need it--American farmers, producers, consumers and other stakeholders. The results of agricultural research can lead to a more competitive environment for agricultural products and help improve quality and consumer demand.

The ARS program budget for FY 2001 is \$896.8 million. We have a total of 8,136 full time employees, including 2,000 PhD level career scientists. We are particularly proud of the fact that only 7-8% of the ARS workforce is in administrative or program management positions—we focus most of our resources on the science itself. ARS scientists operate from more than 100 strategic locations nation-wide and from five locations overseas. These locations reflect the diverse agricultural regions throughout the U.S. and key areas of global importance to American agriculture.

For FY2002, the ARS is requesting \$946.1 million, an increase in funding of \$79.3 million from FY2001. The FY2002 request includes \$915.6 million to support ongoing research and new activities in high priority areas such as new uses for agricultural products, emerging and exotic diseases and pests and biotechnology. In addition, \$30.5 million is provided to fund high priority modernization or construction projects in seven locations.

What does this public investment in agricultural research and infrastructure buy for the American taxpayer? As any economist will tell you, increased productivity is the key to a growing and thriving economy and American agriculture has enjoyed a remarkable rise in productivity during the past sixty years. For example, in 1940, one U.S. farmer fed 19 people. Today one U.S. farmer can feed 129 people. This increase in productivity is, in no small way, due to agricultural research and 75 percent of the growth in American agricultural productivity is accounted for by public investment in agricultural research and development (R&D) and infrastructure.

Americans are getting high returns on their investment in agricultural research. Farmers benefit from agricultural research in the short run because research can lead to lower production costs and higher profits. However, consumers benefit in the long run because research can impact lower food prices and provide for a safer food supply. This impacts lower income Americans more significantly since they spend a greater portion of their income on food. Most studies have found rates of return on the public investment in agricultural research to be between 20-60 percent<sup>(1)</sup>. And, over the years, the tasks of ARS has grown to solving broad technical agricultural problems; ensuring an abundant safe food supply; sustaining a viable and competitive food and agricultural economy; and to maintaining a quality environmental and natural resource base.

Increasingly, international collaboration has become an important aspect of ARS research. As a leader in the global community, the United States has strategic interests around the world and an obligation to the world community to help solve global issues of food insecurity, agricultural pests and diseases, and environmental degradation. ARS actively engages in cooperative agreements with numerous national and international organizations for the benefit of American agriculture.

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<sup>1</sup> Ahearn, Mary, et al. "Agricultural Productivity in the United States,," USDA Economic Research Service, January 1998, p. 10.

Dealing with the introduction of foreign pests and diseases, whether intentionally introduced or not, is a major objective of ARS's research programs. Immediate concern has centered on research into Foot and Mouth Disease (FMD) which has devastated the livestock industry in the United Kingdom(U.K.) in recent months.

This spring, ARS sent a team of veterinarians, including three from ARS, to assist the U.K. government in dealing with the FMD crises. This type of experience provided the Department valuable information about FMD that will benefit the US in our prevention and preparedness efforts.

The 1996 Farm Bill set a new direction for American agriculture by beginning the process of phasing out farm subsidy payments based on production levels and introducing free market disciplines. The effect of this legislation and the 1998 Research Title was to heighten the importance of agricultural research as one form of a safety net beneath producers and ranchers. To help ensure a strong safety net, the two laws updated and expanded the purposes of agricultural research and lifted the bar higher than ever before regarding priority setting and validation of our research programs.

Mr. Chairman, at this time I would like to tell the subcommittee how ARS addressed the eight expanded purposes in the 1996 Farm Bill and how we implemented the priority setting, and relevance and merit sections in the 1998 Research Title. Other provisions in these two laws impact ARS but these are the authorities requiring new or improved direction.

To fully integrate the tenets of the agricultural research purposes into the Agency's processes, ARS incorporated them into its strategic plan, which is the basis of our budget development and response to the Government Performance and Results Act. More importantly, the program structure of the agency was reorganized into 22 national programs that link the purposes with the agency's objectives and ultimately our accomplishments. The following are a few examples of our research and accomplishments as they relate to the eight purposes in the 1996 Farm Bill:

*“Enhance the competitiveness of the United States agriculture and food industry in an increasingly competitive world environment.”*

ARS research has been instrumental in many areas at reducing trade barriers. A notable example is the development of a Pest Risk Assessment (PRA) system developed for wheat dwarf bunt fungus by ARS and industry researchers. This risk assessment system resulted in a 57-page report used by U.S. trade officials during negotiations with China to ease restrictions on U.S. wheat imports. The negotiations centered on China's concern that accepting grain with dwarf bunt fungus could spread the fungus to their domestic wheat crops. The fungus, *Tilletia controversa* Kuhn (TCK), sporadically infects winter wheat crops in the Pacific Northwest, but poses no human health risk. Under certain conditions, it damages the wheat kernel. With the pest risk assessments, our trade negotiators were able to present compelling scientific evidence showing TCK poses a negligible risk to China's domestic wheat crop from U.S. grain imports. The PRAs have also proved invaluable in similar negotiations with India, Brazil and Mexico.

As part of the agreement signed with the United States on April 10, 1999, China eased its zero-tolerance policy. According to USDA estimates, that opened the door to \$150 million worth of possible U.S. wheat exports.

The PRAs draw on more than 10 years of laboratory and field research on TCK's genetic variability, geographic distribution, spore growth, virulence and survival under various crop-production practices and grain handling regimens.

During the past three years ARS scientists played a pivotal role in fighting and winning a major victory for American agriculture. Our scientists took an active part in devising the legal strategy used to prove the U.S. case against Japan in the first ever suit over quarantine issues before the World Trade Organization.

ARS scientists testified for the U.S. and provided scientific data confirming that ARS-developed procedures to prevent codling moths from hitchhiking to Japan on American apples, cherries, nectarines and walnuts regardless of the specific variety. ARS research helped open up previously closed markets, in Japan and other countries, representing millions of dollars to the American agricultural industry.

Critical research that is competitiveness-related is the work our scientists are doing to find alternatives for methyl bromide. Methyl Bromide is a tremendously valuable chemical having both pre and post harvest uses as a pesticide and herbicide. However, it contributes to the depletion of the earth's ozone layer and may have potentially significant environmental consequences worldwide, although the magnitude of the contribution from agricultural uses is uncertain.

Through international agreements, the U.S. is scheduled to ban the production and importation of methyl bromide on January 1, 2005, so the race to find alternatives is an agricultural imperative. Currently, ARS research on methyl bromide includes evaluating potential alternatives and the development of a trapping and recycling system that may allow the continued use of methyl bromide. This research has tremendous potential for growers, processors and packers.

Another significant achievement has been the modernization of sulfur dioxide fumigation technology used to control a form of fungal root rot in table grapes. Through efforts in collaboration with the University of California, this research will help growers maintain the quality of grapes and help increase their marketability in a competitive \$700 million dollar industry.

*“Develop new uses and new products for agricultural commodities, such as alternative fuels, and develop new crops.”*

USDA and the Department of Energy developed joint Bioenergy Initiatives for fiscal years (FY) 2001 and 2002 and have worked together to develop technologies and processes to increase the use of

biobased fuels. ARS research is also focusing on the development of industrial and bioenergy products that offer an opportunity to meet environmental needs, replace exports and petroleum-based products, and expand market opportunities.

Another area addresses the development of advanced materials and manufacturing technologies in the conversion of plant and animal products to biobased plastics, biofuels, soy ink, fiber products, biopesticides, and ingredients for lubricants, specialty chemicals, paint, and health care industries.

Enhanced production, harvesting, and handling of crops that are feedstocks for production of biofuels is also an area of ARS research.

#### More rapid production of environmentally friendly ethanol at less cost.

Separation of the corn kernel and hull in the current corn milling process requires large quantities of sulfites, which can produce serious environmental and health risks. ARS scientists at the Eastern Regional Research Center in Wyndmoor, Pennsylvania and collaborators from the University of Illinois have successfully demonstrated a new corn soaking process, using enzymes to reduce or eliminate the need for sulfites. In addition to environmental and health benefits, preliminary cost estimates indicate the new process cuts steeping time in half and reduces the cost of producing fuel ethanol by several cents per gallon.

#### Process to convert ethanol byproducts to coatings and films.

The volume of byproducts from ethanol production exceeds the demand for use as animal feed which is a barrier to reducing the cost of fuel ethanol. These byproducts contain zein, a major corn protein that has market potential. ARS engineers at the Eastern Regional Research Center have shown by use of laboratory and computer modeling techniques that a production scale continuous process for extracting zein from ethanol byproducts is realistic and economical. This process will result in expanded use of zein for industrial coatings and films and effectively lower the cost of producing fuel ethanol.

*“Maintain an adequate, nutritious, and safe supply of food to meet human nutritional needs and requirements.”*

ARS' food safety research program assesses the safety of animal and plant products and develops methods to control potential food contaminants. ARS' human nutrition research program looks to establish the relationship between diet, nutritional status, and health throughout life and the contribution of diet to disease resistance and the reduction of disorders related to nutrition. The human nutrition program develops methods for determining food components and maintains national food composition databases. The outcomes of these efforts are a safe and nutritious food supply, and a knowledge base that enables humans to make healthful food choices.

ARS' research has found: zinc levels are predictive of mood disturbances and behavior problems in

school aged children, flavonoids inhibit glucose uptake, early nutritional deficits impair learning ability, gender affects heart disease, calcium absorption and bone calcium deposition are most significant during early puberty, and conjugated linoleic acid does not have beneficial effects as previously thought.

*“Increase the long-term productivity of the United States agriculture and food industry while maintaining and enhancing the natural resource base on which rural America and the United States agricultural economy depend.”*

ARS research in natural resources seeks to develop a comprehensive understanding of soil, water, and air, and their interactions with plants and animals, so that new and appropriate technology can be developed for responsible, economically viable, and environmentally sound farming systems.

ARS scientists have developed an environmental alternative to petroleum-based inks. Inks made from 100 percent soybean oil have characteristics that either meet or exceed industry standards for product functionality. The patented technology has been licensed to Franks Research Inc. of Oklahoma City. ARS is also negotiating a license with Quincy Soybean Inc. of Quincy, Illinois to provide a new industrial market for agricultural commodities. In addition to the technology's environmental benefits, 100 percent soy inks have low rub-off characteristics, compared to conventional inks. Degradability of inks made from 100 percent soy oil exceeds inks that are made using blends of soy oil and petroleum resin.

ARS' research accomplishments include: corn and barley with greater nutritional value, a method which separates solids and liquids from swine wastewater, chemicals that destroy harmful bacteria and reduce manure odors, switchgrass buffers which reduce leaching of pesticides into groundwater, polyacrylamide and riparian buffers which limit water pollution, a deer treatment device that reduces ticks which transmit lyme disease, a wetland/reservoir subirrigation system which minimizes sediment and nutrient loading of streams and rivers, and a blowing dust warning system that alerts individuals with health problems.

Another example of how ARS research benefits the environment relates to reducing the amount of phosphate generated by poultry production. High levels of phosphorous in poultry manure create an adverse environmental effect from poultry production. However, reducing nutritionally available phosphorous in the diet generally reduces production performance of broiler chickens. ARS scientists have determined that the level of phosphorous can be reduced in broiler rations when phytase is included to make the phosphorus more available. Thus, adverse effects on growth, feed efficiency or bone strength are avoided and the total amount of phosphorus excreted in the manure is reduced. This discovery will enable the poultry industry to reduce the amount of phosphorus generated from poultry production operations, while maintaining a profitable production system.

*“Improve risk management in the United States agriculture industry.”*

ARS research addresses the multifaceted risks that are inherent in the U.S. food and fiber production and processing systems. They can have economic, environmental, and human health components. The

risks associated with weather extremes, such as droughts and floods often result in serious economic losses and major environmental damage. Serious crop and animal losses can also result from temperature extremes, hail, and other weather conditions. Crop and animal producers frequently suffer severe economic losses from diseases, insects, and other pests. Our objective in this area is targeted towards minimizing and, where feasible, eliminating the impact of these risks through development of better animals and plants and improved production and processing systems.

*“Improve the safe production and processing of, and adding of value to, United States food and fiber resources using methods that maintain the balance between yield and environmental soundness.”*

ARS research develops new and improved management practices, integrated pest management strategies, and integrated sustainable agricultural production systems to enhance the safety, quality, and productivity of the U.S. agricultural production and processing systems, while protecting the Nation's environment.

#### Development of integrated pest management (IPM) technologies and management strategies for large-area application.

ARS has implemented area-wide IPM projects in partnership with other Federal and State institutions and the private sector that have been highly successful in reducing pesticide usage. These projects include: (a) mating disruption for codling moth on tree fruits in the Pacific Northwest, which has resulted in an 80 to 100% reduction in organophosphate pesticide use; and (b) the use of attract and kill technology in the Midwest for corn rootworm that reduces populations by greater than 90 percent with less than 10 percent of the chemicals used in current corn rootworm control regimes. The success of these projects has attracted national and international attention because they point the way toward overcoming barriers to applying IPM practices over very large agricultural areas.

#### New model systems for controlling soil and water erosion.

ARS scientists have developed erosion prediction models, including the Revised Universal Soil Loss Equation (RUSLE), the Revised Wind Erosion Equation (RWEQ), and the Water Erosion Prediction project (WEPP), that will help reduce soil erosion in the United States and elsewhere. Soil erosion lowers the productivity of our agricultural lands and creates water quality problems. These erosion prediction models are being used on a national scale by the Natural Resources Conservation Service to help farmers and land use planners select land management practices that minimize soil losses by wind and water.

*Conduct “agricultural research . . . to promote economic opportunity in rural communities and to meet the increasing demand for information and technology transfer throughout the United States agriculture industry.”*

ARS integrates basic long-term research and targeted short-term research to develop new technologies,

practices, and production enterprises that increase profits, enhance the farm ecosystem, and develop small-scale processing technologies to create value-added products from agricultural commodities. In addition, ARS has improved access to research information, targeted information dissemination, and transfers technology more effectively, as well as enhanced exchange of problem-solving information with domestic and international research organizations. While the introductory focus of our goal in this area is expanding economic opportunities, ARS interprets the information and technology transfer provisions to apply across the board to all areas of agricultural research.

*“Support higher education in agriculture to give the next generation of Americans the knowledge, technology, and applications necessary to enhance the competitiveness of United States agriculture.”*

ARS has a limited role to play in directly supporting higher education. The agency provides training opportunities for graduate and postdoctoral students, enabling them to gain valuable knowledge and experience. Some of these scientists are eventually hired as full-time employees where they serve to maintain and enhance the agency's core scientific capabilities. Most go on to serve U.S. agriculture in other Federal, State, and local agencies, private industry, or academia.

ARS, through the programs and services of the National Agricultural Library, provides access to information for institutions of higher education, their faculties, researchers, and students. In addition, ARS supports public information, outreach, extension, and educational activities.

Mr. Chairman, the message was very clear in the 1998 Research Title that Congress expected rigorous peer review of federally funded research and that research priorities should be established with input from our customers, stakeholders, and partners. In response to the mandate for external input in the establishing research priorities, ARS has conducted more than 40 national program workshops, held in locations all over the country. The workshops brought scientists and national program staffers together with our customers—over 3000 of them. Particularly important to us was talking to producers directly. These workshops featured hundreds of growers and ranchers, who discussed with our scientists the problems and needs they face on the farm or ranch. Together we worked to understand the information or tools that will help them succeed. Representatives from all our customer groups were represented at the workshops, including federal and state partners of ARS, industry groups and businesses, non-governmental organizations, and university researchers. A special effort is made to invite small and disadvantaged producers to these gatherings. We are proud of our workshops - the feedback has been overwhelmingly positive.

After the workshops, our scientists develop *action plans* for each national program designed to solve the problems or fill the needs of our customers. These national workshops are not only helping us to be more responsive to our customers, they are increasing coordination and cooperation across our one hundred locations and our varied scientific disciplines, bringing a more integrated approach to bear on problems of a high national priority. In this way, we strive to meet the needs of the people who use our research directly, targeting our coordinated and cooperative efforts at the problems of our customers.



The 1998 Research Title also directed the Secretary to establish procedures to ensure scientific peer review of all research activities conducted by the Department. The statute requires a review panel to verify, at least once every five years, that each USDA research activity has scientific merit and relevance.

In response, ARS established the Office of Scientific Quality Review in 1999 to manage the agency's research project peer review system. The Office includes a senior scientist called the Scientific Officer who selects a Panel Chair for each six-member panel to review about 20 ARS projects. The Panel Chair and majority of panel reviewers must be non-ARS scientists. Ultimately, each of the approximately 1,100 research projects will be reviewed at least once every five years by a panel comprised of independent and objective subject matter experts who base their evaluations on stringent criteria and relevance to the mission and objectives in ARS' 22 National Programs.

To date, five panel review sessions have been held for 187 research projects. Ninety-nine percent of the reviewers were from outside of ARS. The majority of our projects reviewed were found to require only minor revisions. And I would add that ARS has worked very closely with the National Agricultural Research, Extension, Education, and Economics Advisory Board regarding the establishment and progress of our peer review system.

I want to thank the subcommittee again for the opportunity to be here today. I hope my testimony conveys the message that the 1996 Farm Bill and the 1998 Research Title have served the Agricultural Research Service well. We take great pride in our many achievements on behalf of American agriculture and the American public. With your support we will continue to ensure that America remains a land of plenty--a land with a growing and thriving agricultural economy, abundant in natural resources, a land with a plentiful supply of safe and nutritious food for its people and with the greatest agricultural system in the world.

This concludes my testimony, Mr. Chairman, and I will be happy to answer any questions you or the other Members of the Subcommittee may have at this time.